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| APPLICATION NO.   | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO.     | CONFIRMATION NO.       |
|---|-------------|----------------------|-------------------------|------------------------|
| 10/708,035  | 02/04/2004  | Laertis Economikos   | FIS920030391            | 2034                   |
| 30449 7590 05/11/2009<br>SCHMEISER, OLSEN & WATTS<br>22 CENTURY HILL DRIVE<br>SUITE 302<br>LATHAM, NY 12110 |             |                      | EXAMINER<br>VU, DAVID   |                        |
|   |             |                      | ART UNIT<br>2818        | PAPER NUMBER           |
|   |             |                      | MAIL DATE<br>05/11/2009 | DELIVERY MODE<br>PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                                      |  |  |
|------------------------------|--------------------------------------|--|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/708,035 | <b>Applicant(s)</b><br>ECONOMIKOS ET AL. |  |
|                              | <b>Examiner</b><br>DAVID VU          | <b>Art Unit</b><br>2818                  |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 06 February 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 19-24 and 27-30 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 19-24 and 27-30 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 02/04/04 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

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## **DETAILED ACTION**

### **Election/Restrictions**

1. Applicant's election without traverse of Species I, figs. 5A-5B (Claims 19-24 and 27-30) on 02/05/2009 is acknowledged (see REMARKS dated 02/05/2009).

### **Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 19-24, 27-29 and 30 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Karlsson et al. (US Pat. 6,124,183, hereinafter Karlsson) in view of Kim et al. (US Pat. 7,078,314; hereinafter Kim)

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Regarding claim 21-24, 27 and 29, Karlsson in figs. 2D-2J discloses a method of fabricating a filled trench structure, comprising:

- (a) forming a planarization stop layer 203 on a top surface of a substrate 201 (fig. 2D);
- (b) forming a first set of trenches 205 in a first region of planarization stop layer 203 and substrate 201 and forming a second set of trenches 206 in a second region of planarization stop layer 203 and substrate 201, trenches in first set of trenches 205 having a higher aspect ratio than trenches 206 in second region (fig. 2E);
- (c) depositing a layer of a fill material 208 in and over first and second sets of trenches and on a top surface of planarization stop layer 203, fill material 208 completely filling each trench of first set of trenches 205 and completely filling each trench of second sets of trenches 206 (fig. 2F), a first thickness of layer of fill material directly over each trench of first set of trenches is **inherently** greater than a second thickness of layer of fill material directly over each trench of second set of trenches 124 {**see Spikes (US Pat. 5,981,354); col. 5, line 64 through col. 6, line 12 and Kuroi et al. (US Pat 5,889,335); fig. 27, col. 9, lines 55-65}**};
- (d), after (c):
  - (i) forming a mask layer 211 on layer of fill material 208 (fig. 2H);
  - (ii) forming a opening in mask layer 211 in first region and over trenches of first set of trenches (fig. 2H);

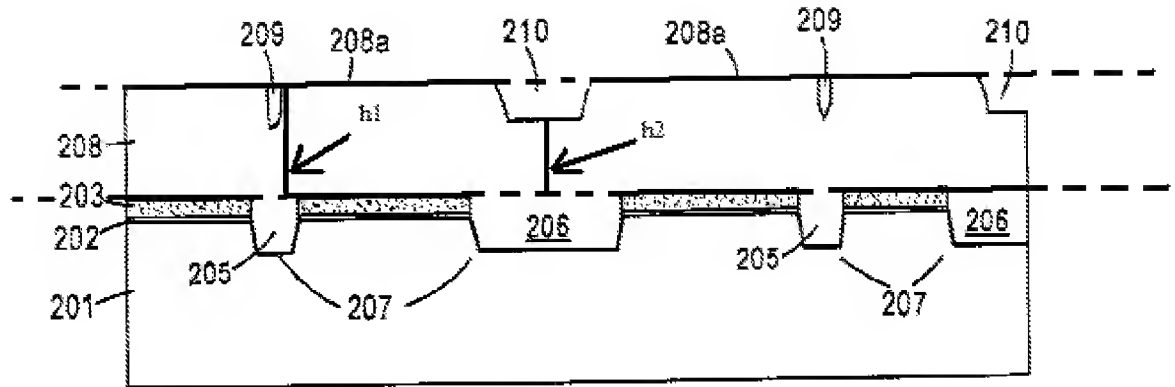


Figure 2G

(iii) removing a layer of fill material 208 exposed in opening, fill material 208 still completely filling each trench of first set of trenches, after removing a layer of fill material 208, fill layer of material 208 thicker over planarization stop layer 203 (t3) between adjacent trenches of first set of trenches 205 than over fill material contained within each trench of said first set of trenches (208 material inside trench 205; t4) (col. 5, line 54-60 and fig. 2I); and

(iv) removing masking layer 211 (col. 5, line 60); and

(e) after step (d), removing, using a planarization process (fig. 2J and col. 5, lines 60-65), all of fill material from top surface of planarization stop layer and over first and second set region, fill material still completely filling each trench of first set of trenches and each trench of

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second set of trenches, a top surface of fill material in first set of trenches and a top surface of fill material in second sets of trenches co-planar with top surface of planarization stop layer.

Karlsson fails to disclose the first set of trenches having at least two more adjacent trenches. However, Kim teaches an array of trench 450 (fig. 4M) having a high aspect ratio are formed in a core region. In view of such teaching, it would have been obvious to the ordinary artisan at the time the invention was made to modify the invention of Karlsson by forming an array of trench in order to form the core isolation trench in the core memory region.

\*\*\*Regarding step (d) (iii), as shown in fig. 2G of Karlsson, before the mask/removing step, (same step (i) and (iii)) of the present application), the fill material 208 is thicker over the planarization stop layer 203 than over the trench 205/206 (due to the gaps 209/210 are formed on each trench). Since the first set of trench (trench 205) area is exposed under the same etching condition, the amount of the fill material 208 being etched over the planarization stop layer 203 and over the trench 205 is the same. As a result, at some point during the removing process, before the gap 209 is planarized or before the layer 208 having a substantially planar upper surface, the remaining layer of fill material 203 must be thicker over planarization stop layer 203 between adjacent trenches of first set of trenches 205 than over each trench of first set of trenches 205. Moreover, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that “a remaining layer of said fill material thicker over said planarization stop layer between adjacent trenches of said first set of trenches than over each trench of said first set of trenches” are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical,

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and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

Regarding claim 19, at some point during the removing process,  $t_1 = t_2$  (when the layer 208 having a substantially planar upper surface).

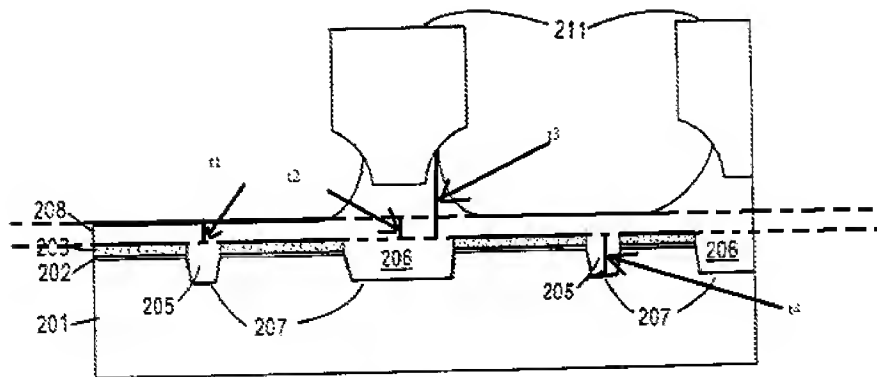


Figure 2I

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Regarding claim 29, Kim discloses a memory device having a periphery isolation region and core isolation region. A core trench having an aspect ratio of approximately 7.0-8.0 or more and a periphery isolation trench having an aspect ratio of approximately 7.0-8.0 or less (col. 13, lines 12-13 and lines 56-57) (see the **CONCLUSION** of the Non-final office action dated 11/26/08).

Regarding claim 30, Karlsson discloses fill material is selected from the group consisting of: high-density plasma oxide, low-pressure chemical vapor deposition oxide, tetraethoxysilane oxide (col. 5, lines 27-35).

Regarding claims 20 and 28, the combination of Karlsson and Kim fails to disclose the fill material is removed about 5 to 20% of the as deposited thickness (claim 20); and the aspect ratio of the first/second trenches (claim 28). It would have been obvious to one with ordinary skill in the art at the time of the invention to perform an etched back process step as taught by Karlsson and Kim. The amount of the fill material being etched and the aspect ratio of the first/second trenches does not define patentable over Karlsson and Kim since it is well known processing variable and the discovery of the optimum or workable range involves only routine skill in the art. The specific amount of the semiconductor being etched does not provide any critical or unexpected results to the method of manufacturing a semiconductor device. Rather, it is merely an obvious selection of the etching amount based on desired functional characteristics determinable by routine experimentation. *In re Aller*, the court stated, "Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller*, 220 F.2d 454, 456 105 USPQ 233,235



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(CCPA 1995). Moreover, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for example, *In re Rose*, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); *Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); *In re Dailey*, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

### **Response to Arguments**

3. Applicant's arguments with respect to the pending claims have been considered but are moot in view of the new ground(s) of rejection.

### **Conclusion**

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4. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David Vu whose telephone number is (571) 272-1798. The examiner can normally be reached on Monday-Friday from 8:00am to 5:00pm. If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Loke H can be reached on (571) 272-1657. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR, Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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/DAVID VU/  
Primary Examiner, Art Unit 2818